BOTULISM INFORMATION SHEET

In response to your recent inquiry concerning ducks dying in your area, please note the following:

Botulism "C" is a common disease affecting ducks throughout the United States. In northern areas its occurrence is restricted to warmer months, but here in South Florida it can be a year round phenomenon. It is most common in an alkaline aquatic environment.

The disease, commonly called "Botulism C", is caused by a bacterium of the genus Clostridium, the same genus that causes Tetanus and food poisoning in humans. However, it should be noted that this bacterium is not transmitted to humans and does not cause Tetanus or food poisoning. These rod-shaped bacteria live in anaerobic conditions and have the ability to survive adverse conditions by forming resistant spores. These spores can lie dormant for considerable periods of time, due to their resistant outer covering and low metabolic activity; however, they can resume their virulent activity as soon as conditions become favorable. This helps explain the sudden and erratic occurrence of the disease.

There are several lines of thought concerning the epidemiology and causes of the disease. The following two ideas are prevalent:

1. The botulism organism lies dormant (in the spore state) in lakes and streams. Almost any situation leading to anaerobic (lack of oxygen) conditions can provide a suitable environment for proliferation of the bacterium. Most commonly a heavy growth of aquatic plants, followed by decay and diminished oxygen in the water, leads to anaerobic conditions. The bacteria increase as the oxygen level drops due to decomposition of plants and other organic matter; these increased nutrients in the water provide food for bacteria.

   Ducks living in such an environment would ingest the now virulent form of the bacteria. The bacteria produces a toxin which infects the tissues, resulting in muscle paralysis and hence the appearance of the "limp neck symptom". Death and decomposition of affected ducks reintroduces the toxin and bacterium to the water.

   When unfavorable conditions for the bacteria return (i.e. increased oxygen), the disease organisms change into the harmless spore state and are then available for another epidemic in the future.

2. In this case the bacteria are present in the spore state in the water; however, insect larvae and other creatures ingest the spores. When a condition occurs that causes a lessened oxygen supply in the water, the insect larvae and other animals die. The spores in their intestines become active bacteria that increase in the decomposing tissue, producing a toxin. Ducks ingest these bacteria and decaying larvae along with the food they eat, and the toxin then has its effect. The death and decomposition of the ducks compound the problem by again releasing more bacteria (and toxin) into the water.

The return of normal conditions causes the Clostridium bacterium to again form resistant spores.

There is no practical way of avoiding this disease and the problems associated with it except to keep the ducks out of the water and not feed them food collected from the water. Once a duck is infected it

will not usually recover on its own. However, if ailing ducks are given fresh water or an antitoxin, the recovery rates can be fairly high according to the Florida Fish and Wildlife Conservation Commission.

All dead ducks should be taken from the water to prevent the release of bacteria and toxins into the water. Indeed, an ailing duck (i.e. muscovy) should not be allowed to roam free for it could succumb to the disease and its death could go undetected in the water. However, it should be noted that handling, capturing or confining mallards or any specie of wild ducks requires permits from both the U.S. Fish and Wildlife Service and the Florida Fish and Wildlife Conservation Commission.

SUMMARY

1. Botulism "C" is a naturally occurring disease caused by a bacterium that thrives in anaerobic, alkaline, aquatic environments. The organism can survive inhospitable conditions in a harmless state by forming spores.

2. Anaerobic conditions in the water lead to a proliferation of the bacterium.

3. Ducks ingest bacteria, which produce disease-causing toxin in their tissues.

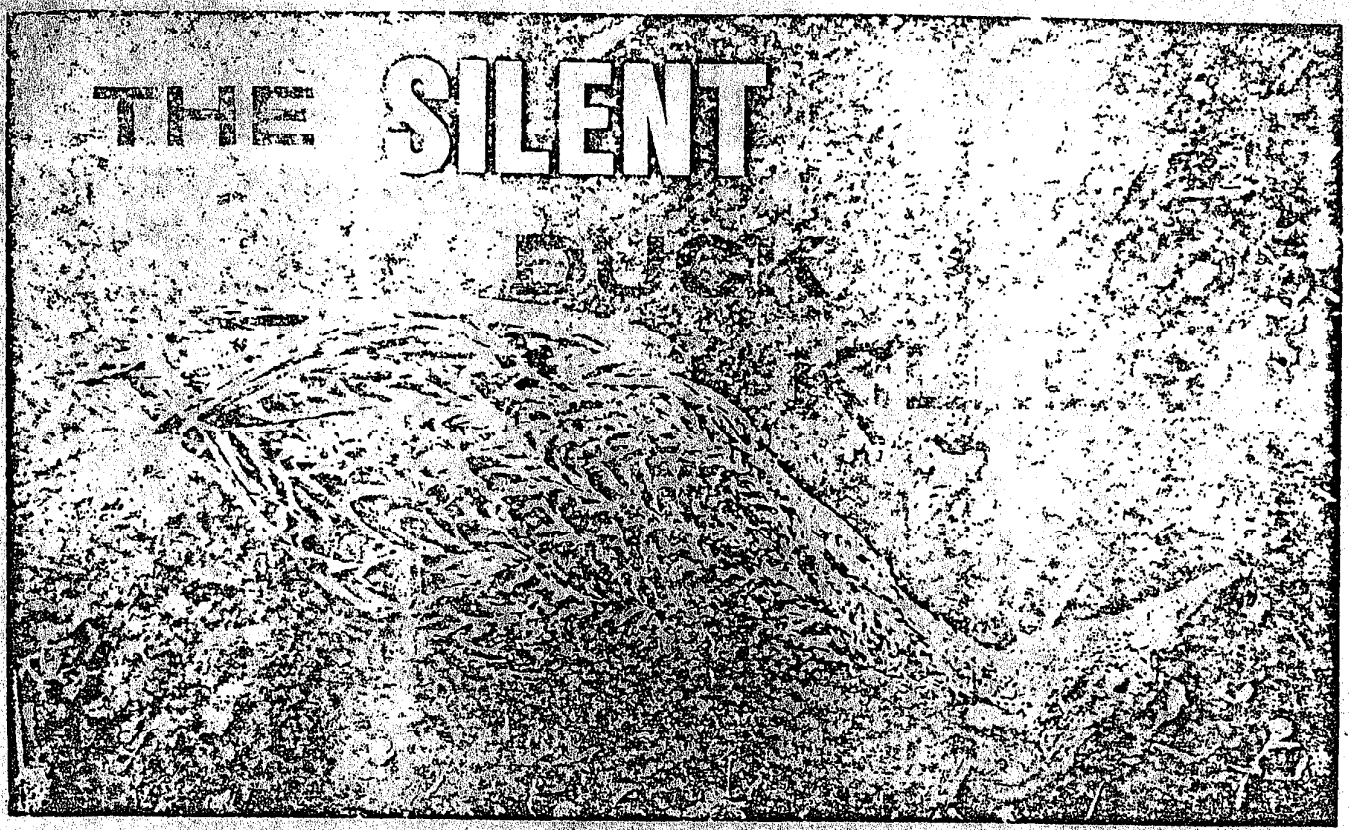
4. "Limp Neck" symptom is the manifestation of the toxin's effect; drowning often results from this symptom.

5. Keeping ducks out of the water and feeding them food not from the water will prevent infection if the animal has not yet been infected.

6. Remove all dead ducks from the water. Do not allow ailing ducks to roam free; they could die undetected in the water and release the bacterium.

7. Ailing ducks may be treated by giving them fresh water or an injection of an antitoxin; the recovery rate can be fairly high.

Updated March 29 2002
L. Cancela



Sound wetlands management reduces botulism losses in waterfowl

By JERRY HUBBARD

A lone pintail duck wings its way over a shallow pond looking for an inviting spot to feed. Spying it, it drops down among the reeds and eats away. About 10 hours later, it loses balance and its neck muscles weaken. Soon its head drops into the water and it drowns.

Along with its dinner, the pintail ingested a toxin produced by a lethal strain of bacteria, *clostridium botulinum, Type C*. This bacteria causes botulism or Western duck sickness. It is the silent killer which took approximately 15 million waterfowl between 1910 and 1935 and many more since. Most died the way the pintail did.

Although botulism can't be completely stopped, proper wetlands management can keep it in check. First, however, private land owners and duck hunters must recognize the warning signals. Knowing these and acting upon them will help to avert large crippling outbreaks of the disease like the big one in 1910 and one in California as recently as 1969.

The 1910 epidemic of an unknown disease in the Great Salt Lake killed hundreds of thousands of water birds and caused great concern among the naturalists of the time. The best explanation then was that the kill was caused by "alkali poisoning". In 1922 Dr. Ida Bengtson was conducting a study in which she found that a bacteria identified as *clostridium botulinum* **Type C**, caused the same effects in ducks as did the "alkali poisoning". In 1930, Dr. E. R. Kalmbach linked this bacteria to waterfowl deaths in Oregon. Although other research was underway, Bengtson's and Kalmbach's were the most significant early studies of botulism.

Early Names For Botulism

Before the disease was identified, it was known as Western duck sickness. When it affected poultry, farmers knew it as "limberneck". Both terms are still used today. Botulism is a form of food poisoning. Researchers isolated the disease around 1920 and continued intensive studies from 1920 to 1935. Of many forms of the bacteria, Type C is the only one that affects aquatic wild birds. It proliferates in our Western States.

Clostridium is an anerobic bacteria, that is, an organism capable of carrying on its life processes in the absence of free oxygen. These soil organisms are widely dispersed in many areas. The botulism bacteria is a rod-like spore producer. It must have a host, usually an invertebrate insect or maggot. The bacteria then produces a toxin which affects ducks and other aquatic birds which feed on the insects, if the conditions are right.

C. botulinim **Type C** is a warm-weather bacteria. The usual time for its maturation is from late July to mid-September, although California birds have died in mid-October from this disease. Water at 77°F. - 86°F. provides an ideal medium for toxin to develop. Above 99°F. toxin production is greatly reduced. When cold weather sets in, botulism outbreaks diminish, but toxin built up during warm weather can remain. Sometimes botulism *will* show up in the winter.

Certain basic conditions must be met in a wetlands ecosystem for botulism to

Source material and photographs for this feature were supplied to the author by the California Department of Fish and Game, and Brian F. Hunter, a wildlife pathologist for that department who has conducted extensive research on botulism in waterfowl.

occur. These are: warm temperature, animal protein food supply, and high moisture.

The water supply is one of the most important factors in triggering botulism outbreaks. Water which is slightly alkaline is best for botulism toxin production. A fluctuating water supply may cause large amounts of the bacteria to be exposed to conditions favorable for toxin to build up. This occurs most often in lakes or ponds with gradually sloping bottoms. Where water is shallow, it tends to be warmer, rendering prime conditions for botulism toxin production.

When water floods into low-lying areas, killing terrestrial insects, the carcasses provide hosts for toxin-producing bacteria. When a pond or lake passes its peak production of plant material, the result is a massive die-off of invertebrates that feed on the plants. Dead organic matter, either plant or animal, may become host to the bacteria. Studies show, however, that dead animal material is more important than plant matter for toxin production.

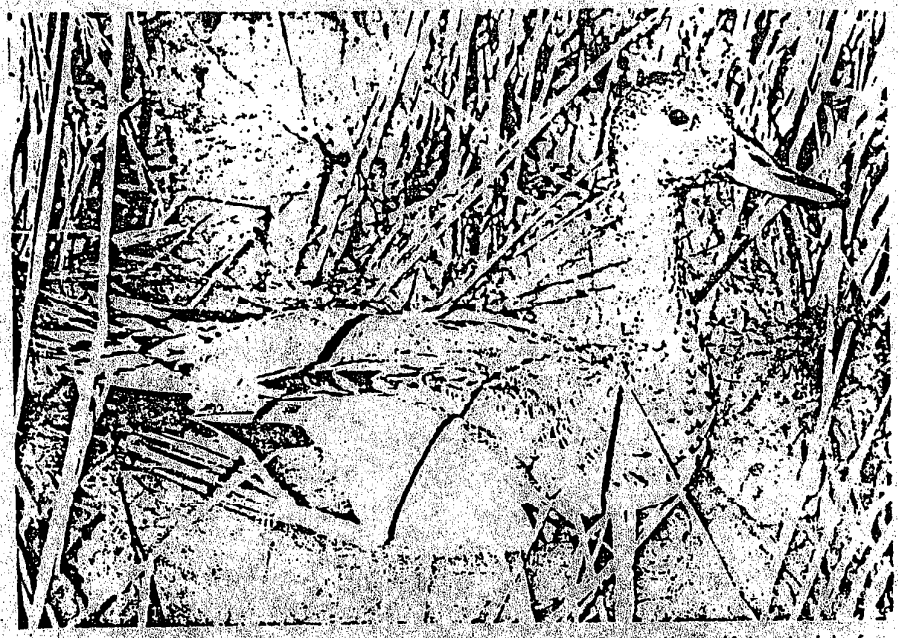
The most important carriers of botulism toxin are maggots. When the first birds die of the disease, if the carcasses are not quickly removed, flies will lay their eggs in the decaying flesh. Ducks are especially fond of maggots. A deadly cycle starts as more dead and decaying ducks produce more maggots. As healthy ducks eat these maggots, they too succumb. Without control of this "maggot cycle" a few isolated cases of botulism can balloon into a major outbreak.

How botulism affects waterfowl depends upon how much toxin has been ingested. Toxin swallowed by the bird is immediately absorbed through the intestinal wall. It is carried by the blood to the peripheral nervous system where the toxin induces various stages of paralysis. If the dosage is large enough, the respiratory system is paralyzed and the bird dies.

Early Botulism Symptoms

Bright green droppings from diarrhea are one of the first symptoms. The feathers around the vent will be stained green. This also precedes many other diseases; but even if it cannot pin-point the exact cause, it puts us one step ahead of a major outbreak. Sometimes the nictitating membrane of the eye will become paralyzed and the bird will no longer be able to keep its eyes moist. If the bird lives, this sometimes results in eye damage.

When affected with the disease, the birds are classified into three categories:



Pintail exhibits droopy wing, an early symptom of Type C botulism. If treated before disease reaches advanced stages, birds stand a reasonable chance for recovery (Calif. Dept. of Fish & Game).

Class I birds are the least sick, but the effects are visible. They can usually walk but are unable to fly as their weakening wings begin to droop. It is possible to save these birds by moving them to a location with fresh water and cover.

Class II birds are visibly worse than those of Class I. In addition to their inability to fly, affected Class II birds also suffer from leg paralysis and while bound to land or water must push themselves along with what strength remains in their already weak wings. Even at this stage in the disease, birds can be saved by a freshwater mouth drench or innoculation.

The biologist caring for a Class II diseased bird can administer a fresh water drench with a battery syringe by pouring two or three ounces of water down the bird's throat. The bird must then be placed out of direct sunlight until it recuperates.

A "duck hospital" has been devised to protect these treated birds until recovery. This should be built next to a running stream or a clean pond. A wire fence encloses an area big enough to hold the amount of birds expected to need treatment. Part of this enclosure should be on dry land, the other part in the fresh water. A windshield should be erected on the prevailing wind side. Shade is a necessity and should be provided on a section of the dry area. After treatment the bird is placed in the enclosure. When recovery occurs and flight returns, the bird may leave under its own power because the "duck hospital" has no roof.

Many birds recover from the Class II type of sickness if treatment is applied properly and promptly.

Class III birds are near terminal stages of the disease. They are usually completely paralyzed and cannot hold up their heads. If they are in the water when this occurs, the birds drown. A Class III bird can seldom be saved, even with a fresh water drench or inoculation.

Green-stained vent feathers are the only external symptom showing after the birds dies. There are no gross external lesions. The internal organs appear normal, with the exception of congested blood vessels around the intestine. The birds are in good flesh and do not become emaciated. In fact, people may eat birds that have died of botulism, because Type C does not affect humans, and cooking reduces the toxin to a harmless state.

Depending on how much toxin they have taken into their systems, birds can die within three hours. But the normal time span between ingestion and death is from six to 25 hours.

Botulism affects a total of 69 different species in a range of 21 families of birds. These include ducks, geese, gulls, blackbirds, herons, hawks and sandpipers.

Although the main control on duck populations is the success of the last breeding season, botulism can be a limiting factor. The weather is right for the bacteria to produce toxin about the time the young are ready to fly south, as ducks gather in their staging areas

Summer a tough time for ducks

By MOLLY HENNESSY-FISKE
Herald Writer

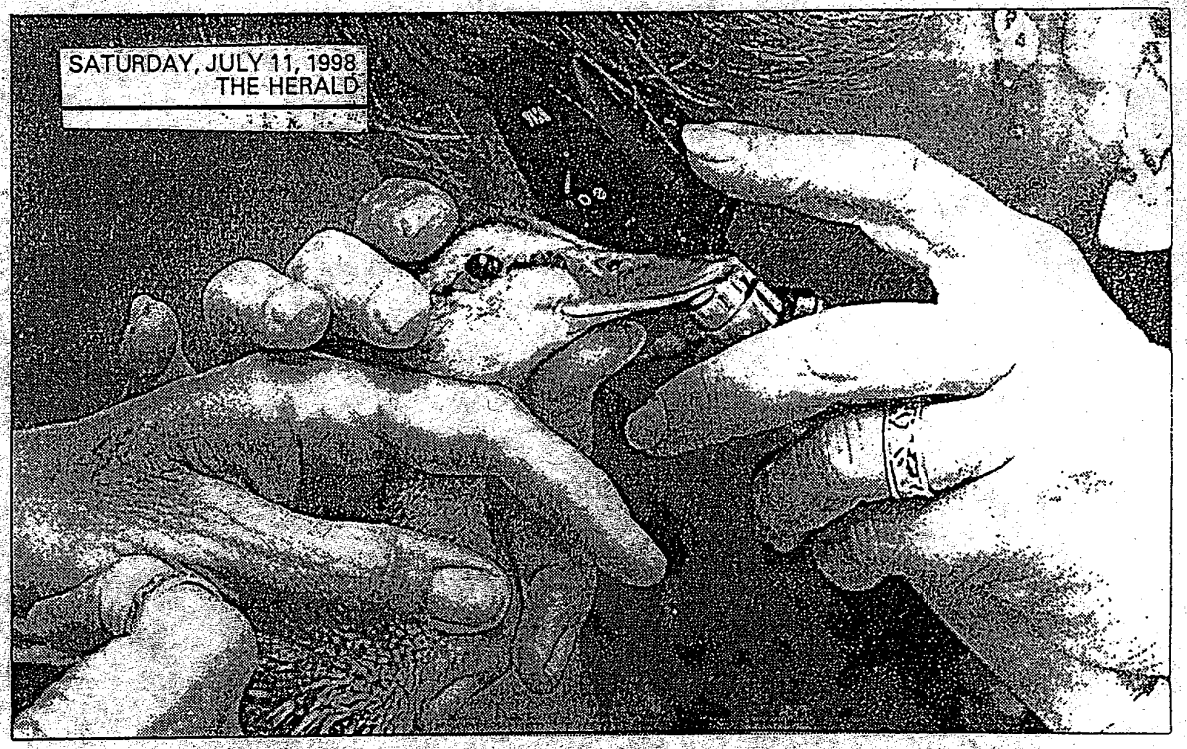
A small group of children nudged each other as emergency specialist John Masek worked on a victim huddling quietly at the end of a shallow pond.

The victim: a young white Pekin duck that apparently fell ill after drinking bacteria-contaminated water from the pond, Masek said.

"I tried to feed him several times," says John Flinn, a personal trainer who lives in the Coral Springs apartment complex where Masek brought his ambulance Tuesday afternoon. "He wouldn't take any food and he was very slumped over."

According to apartment manager Melinda Cameron, the sick duck was one of about 20 bought a month ago by Copperfield Apartments on Wiles Road, which surrounds the pond.

The rescue is nothing new. Masek often picks up sick ducks like the one he slipped into a pet carrier Monday in Coral Springs. These days the nonprofit Wildlife Care Center in Fort Lauderdale, Masek's headquarters, has been gathering waterfowl from Broward, Miami-Dade and Palm Beach counties, although most recent cases have been from Broward. This may be the ambulance driver's busiest season, as young ducklings find their way into sewer drains and older ducks drink bottom-dwelling bacteria and get sick.



EMILY KELSEY / Herald Staff

THE DOCTOR IS IN: Deb Anderson, a veterinarian at the Wildlife Care Center, inspects a duckling.

The Wildlife Care Center responded to 20 calls for ducks in distress in Broward, Dade and Palm Beach Counties on Monday alone — about average, according to staff member Tammy Koross.

"Almost every other call is for ducks," Koross said. "Curious ducks get into trouble. They're like little 2-year-olds touching things they shouldn't."

Deb Anderson, a veterinarian at the Wildlife Care Center, said ducks like the one in Coral Springs may be exposed to harmful bacteria as they stir up dirt at the bottom of area ponds and lakes. Human, who generally drink treated water or surface fresh water, are not in danger of exposure to the naturally occurring bacteria. But ducks, who often dip beneath the bottom, risk ingesting both the bacteria and the botulin toxins they produce. The process, called botulization, causes paralysis that may prove fatal if the birds are not tube-fed soon after drinking the dirty water.

"But it depends on what stage you catch them," Koross said of curing botulized ducks.

Andrea Smith, a Wildlife Care Center volunteer in Sunrise, advised those who find ducks with symptoms of botulism, which range from drooping wings to stiff legs, to feed the birds bread dipped in olive oil to flush out their stomachs.

THE MIAMI HERALD, SUNDAY, APRIL 7, 1991

1.

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The Muscovy ducks in my lake are making a terrible mess of my dock. They sleep on the dock and, every morning, I have to clean up their droppings. It's sickening and I'm sick of it. Am I allowed to kill them? — Justo Valverde, Miami

Yes, but do it humanely — via population control, says David Hitzig, director of the Wildlife Rehabilitation and Environmental Education Center in Miami. He gets calls from lots of people with Muscovy duck problems. The ducks are introduced exotics, not native wildlife, and are not protected by any state or federal law. They were first bred for food, as farm animals. Most of their natural instincts have been lost and they have no natural population control, he says. The ducks are now laying eggs. The best way to get rid of them is to scout around for the nests, collect the eggs, put them in the freezer overnight and then throw them away. It won't be an overnight solution, but it will work in the long run. If you're in a hurry — well, the ducks *are* edible.

2.

ACTION REACTION: On April 7, Action Line gave advice on getting rid of Muscovy ducks. You neglected an important possibility. When my wife and I bought our first home in Connecticut, we unknowingly acquired a flock of Muscovy ducks who lived between our house and the brook in our back yard. As you said, they're edible — very much so. They're meaty and less fat than commercially-grown ducks and a bit larger, just the right size for holiday gatherings. But freezing the eggs and throwing them away is a big waste. Muscovy eggs are larger than a hen's and a bit stronger in flavor. We didn't like them soft-boiled, but they were fine scrambled or used in cooking. They're easy to find and keep as well as hen's eggs. Valverde is missing a good bet if he just freezes and discards them. — Reuel A. Benson Jr., Jupiter

ACTION REACTION: Action Line's April 7 column was surely ironic. First you tell someone rich enough to own a dock, but not humane enough to see the beauty in animals, that it is OK to kill Muscovy ducks that are bothering him. You follow that with a Sound Off about someone who has carelessly and needlessly killed a puppy. In all the calls and letters you got for help, couldn't you have found time to help somebody in trouble, instead of telling how to kill? How about ignoring people like that? — T.I.F., Miami

ACTION REACTION: As a member of the Wildlife Care Center and Ducks Unlimited, I was incensed by your item on Muscovy ducks. How dare you! What you advised is inhumane. — W. Richardson, Miami

3.

ACTION REACTION: Judging by the Action Reactions I've read, your advice on controlling Muscovy ducks has upset some people. They should be told that wildlife centers and nature groups have determined that collecting the eggs, freezing them and then disposing of them is not illegal or inhumane. The Muscovy is not considered a wild duck, having been domesticated almost all over the globe. When I first observed these ducks, as large as geese, I was impressed by their coloration and plumage of red, white, black and gray. But this duck spends a lot of time on land, where its uncontrollable droppings are a problem. — Aaron Lamkay, nature columnist, Deerfield Beach

SUNDAY
April 21, 1991

SUBURBAN DUCKS

TWO TYPES of ducks make their home in the suburbs — the domestic mallard and domestic muscoy.

THE ADULT MALLARD weighs a little over two pounds. The male mallard has a green head, black tail, brown chest, orange feet and a yellow bill. The female has an orange bill and brown feathers.

THE ADULT MUSCOVY weighs about five pounds. It is a more aggressive duck and has the distinctive pink beak with orange knobs. The muscovy has cross-bred so often that it can be various colors. Many are black and white.

DUCKS CAN LIVE up to 10 years. They breed primarily in the late spring or early summer. But in South Florida's warm climate, they can breed year-round. Females lay about nine eggs at a time.

SOURCE: Dave Brakhage, a water fowl biologist with the Florida Game and Fresh Water Fish Commission

sion, said his agency has no authority over ducks. It handles only exotic or endangered wildlife.

"People really cause the problem," Brakhage said. "They buy the ducklings at Easter time, keep them until they're not cute anymore and then turn them loose into public waters. Then they become a public nuisance."

Brakhage said it's possible that the ducks are unable to get over the new fence.

The duck dilemma is an almost unsolvable problem, he said.

Hugo Morales, the country club's manager, said he'll talk to his groundskeepers about catching the ducks and bringing them home.

"We enjoy them over here," Morales said. "We have a lot of wildlife. Raccoon, opossums and snakes."

Morales said the ducks can come home to the 172-acre golf course anytime they want.

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